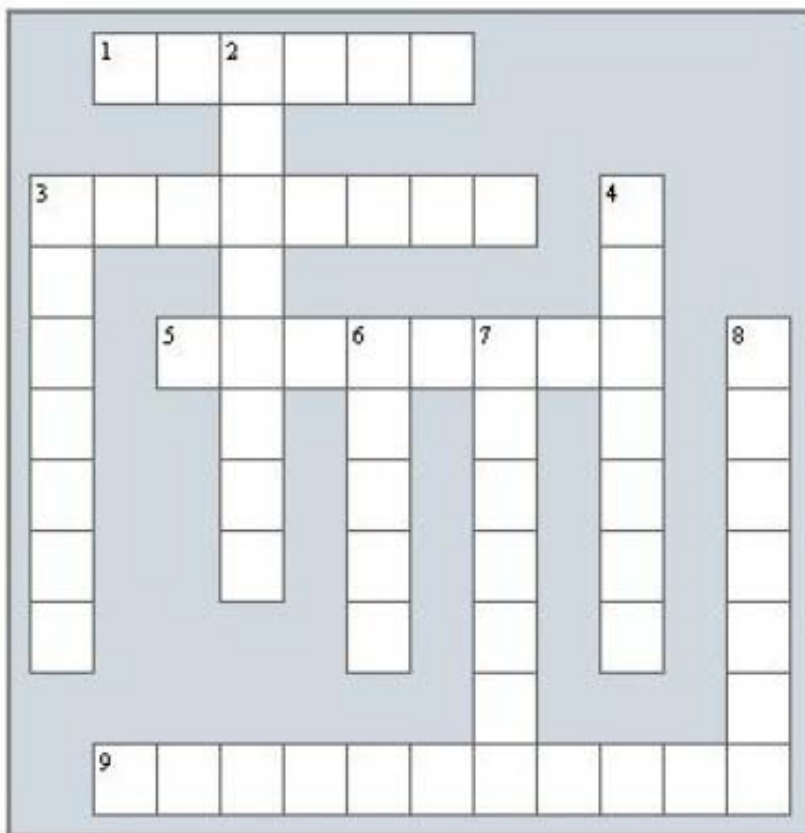
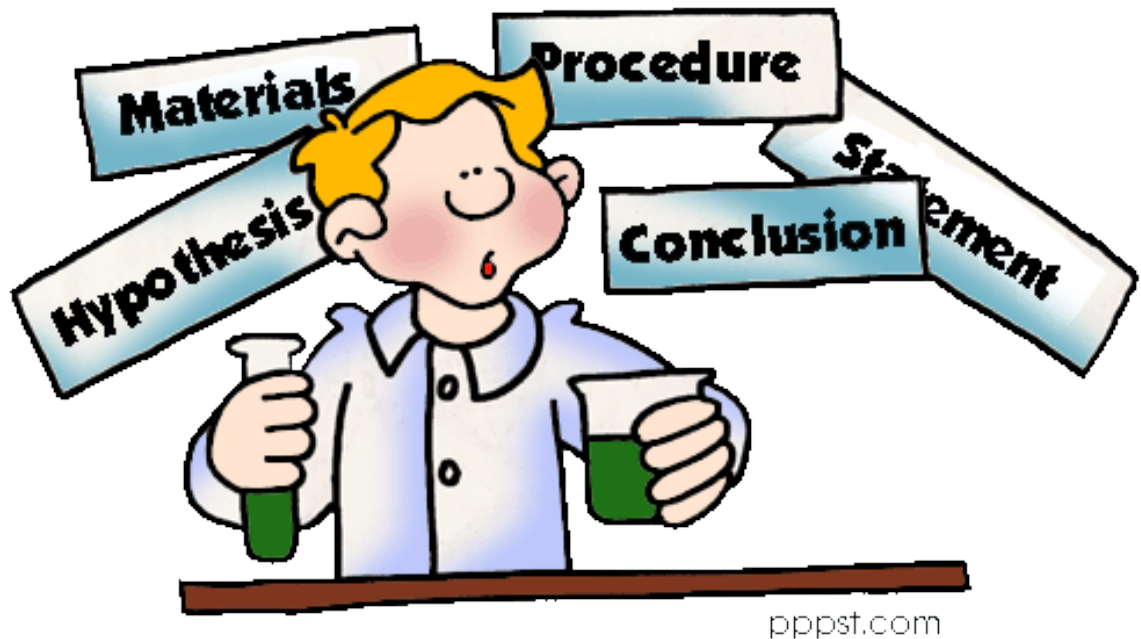
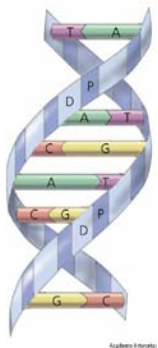


Unit 1: Study of Biology/Scientific Method

Term 3

11-12



Use the Clues Below to Complete the Crossword

Across

- 2. A proposed solution for a problem or an explanation for why something happens that can be tested
- 5. To examine results using different methods, such as tables and graphs in order to see relationships more clearly
- 7. To put separate parts together systematically in order to gain a better understanding

Down

- 1. To make a decision based on results
- 3. A controlled test for verifying facts and assumptions or for generating data
- 4. Information that is gathered for analysis
- 6. A question or issue that needs to be solved

UNIT 1 : STUDY OF BIOLOGY/SCIENTIFIC METHOD

<i>Unit Must Knows</i>	<i>Key Vocabulary</i>
<p>1) Students will be able to understand and follow procedures relating the scientific investigations.</p> <ul style="list-style-type: none"> a) A hypothesis is formed from observations. b) An experiment is used to test a hypothesis. c) A prediction is made before the experiment begins and predicts the outcome of the test. d) Data tables and graphs are used to clearly exhibit information. e) A theory is formed when several scientists perform the same experiment numerous times and achieve the same result. <p>2) Students will be able to list and define the characteristics of all living things.</p> <ul style="list-style-type: none"> a) Living organisms are diverse but share certain characteristics. b) All living organisms are composed of cells, grow and develop, and are able to maintain homeostasis. c) Living organisms reproduce, producing offspring similar to themselves. d) Living organisms obtain and use energy to stay alive, and their respond to their environment. e) Seven themes unify the science of biology: cellular structure and function, reproduction, metabolism, homeostasis, heredity, evolution, and interdependence. <p>3) Students will be able to describe the hierarchy of organizational levels.</p> <ul style="list-style-type: none"> a) Cells create tissues → tissues create organs → organs create organ systems <p>4) Students will be able to define genetic engineering and evaluate its impact on society.</p> <ul style="list-style-type: none"> a) A growing demand for food is a current environmental problem caused by the growing human population. b) Genetic engineering can help make food larger, with more nutrients, and resistant to herbicides. c) Biological research and new technologies will help scientists battle diseases such as AIDS, cancer, and cystic fibrosis. d) The Human Genome Project helps researchers by providing a copy of DNA with every gene shown in its exact location. 	<ul style="list-style-type: none"> • Biology • Cell • Reproduction • Metabolism • Homeostasis • Gene • Heredity • Mutation • Evolution • Species • Natural Selection • Ecology • Genome • HIV • Cancer • Cystic Fibrosis • Gene Therapy • Observation • Hypothesis • Prediction • pH • Experiment • Control Group • Independent Variable • Dependent Variable • Theory

Word Parts Unit 1: Biology and You

Prefix

Suffix

Bio -		-ology	
Phys-		-ic	
Chem-		-istry	
a-		-ist	

Using your prefixes and suffixes break the word into parts and define the following:

Word	Prefixes and Suffixes Used	Meaning
Biology		
Chemistry		
abiotic		
Physicists		

Create the word based on the meaning:

Word	Prefixes and Suffixes Used	Meaning
		Pertaining to life
		Person who studies chemistry
		Study of motion

Use the word parts above to make 3 other words:

Word	Prefixes and Suffixes Used	Meaning

Define the following word:

Word	Prefixes and Suffixes Used	Meaning
Biochemist		

Unit 1: Study of Biology/Scientific Method Terms & Definitions

Write the definition and use the term in a sentence

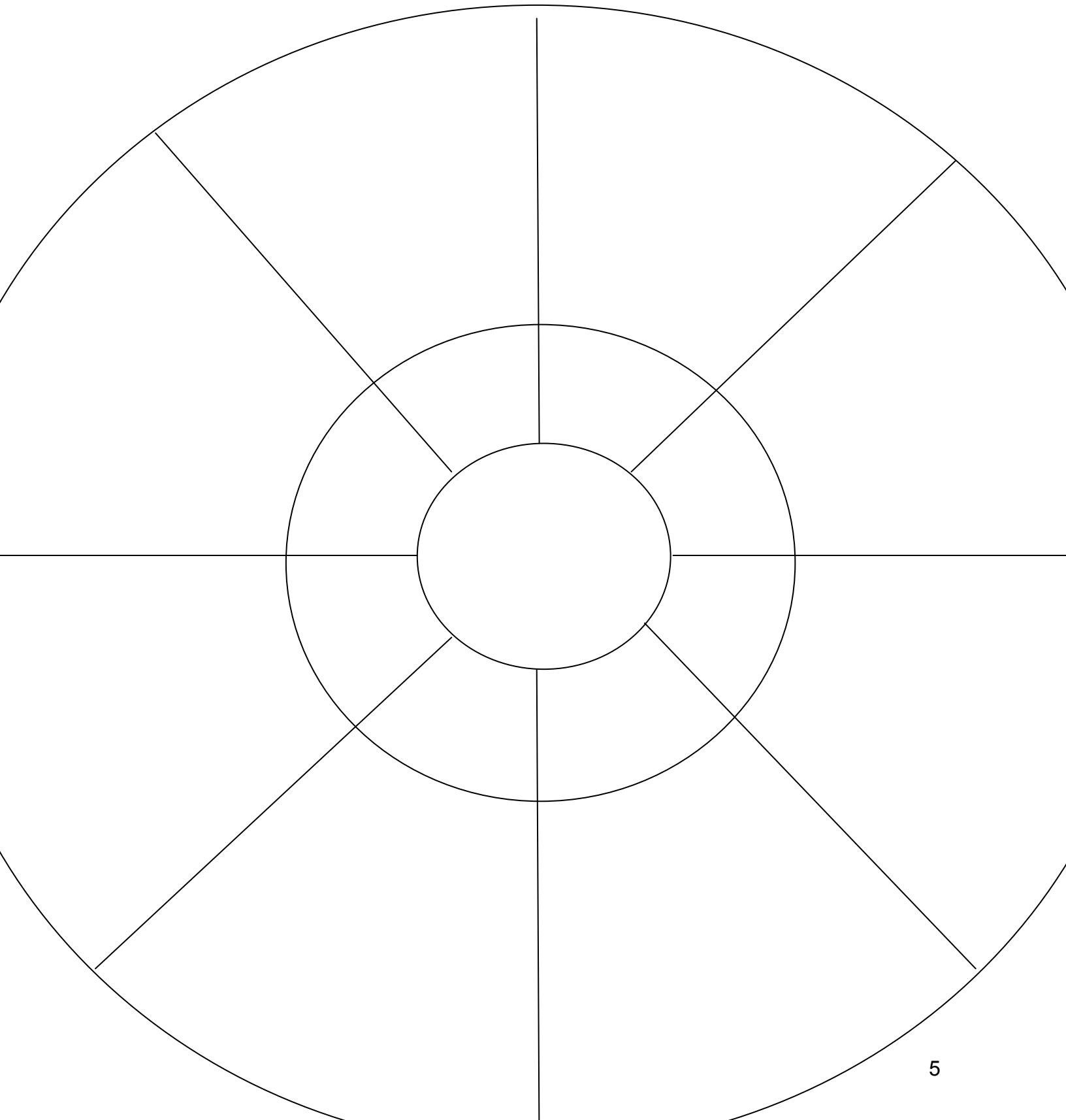
Content Terms:

Biology	Gene Therapy
Cell	Observation
Reproduction	Hypothesis
Metabolism	Prediction
Homeostasis	pH
Gene	Experiment
Heredity	Control Group
Mutation	Independent Variable
Evolution	Dependent Variable
Species	Theory
Natural Selection	

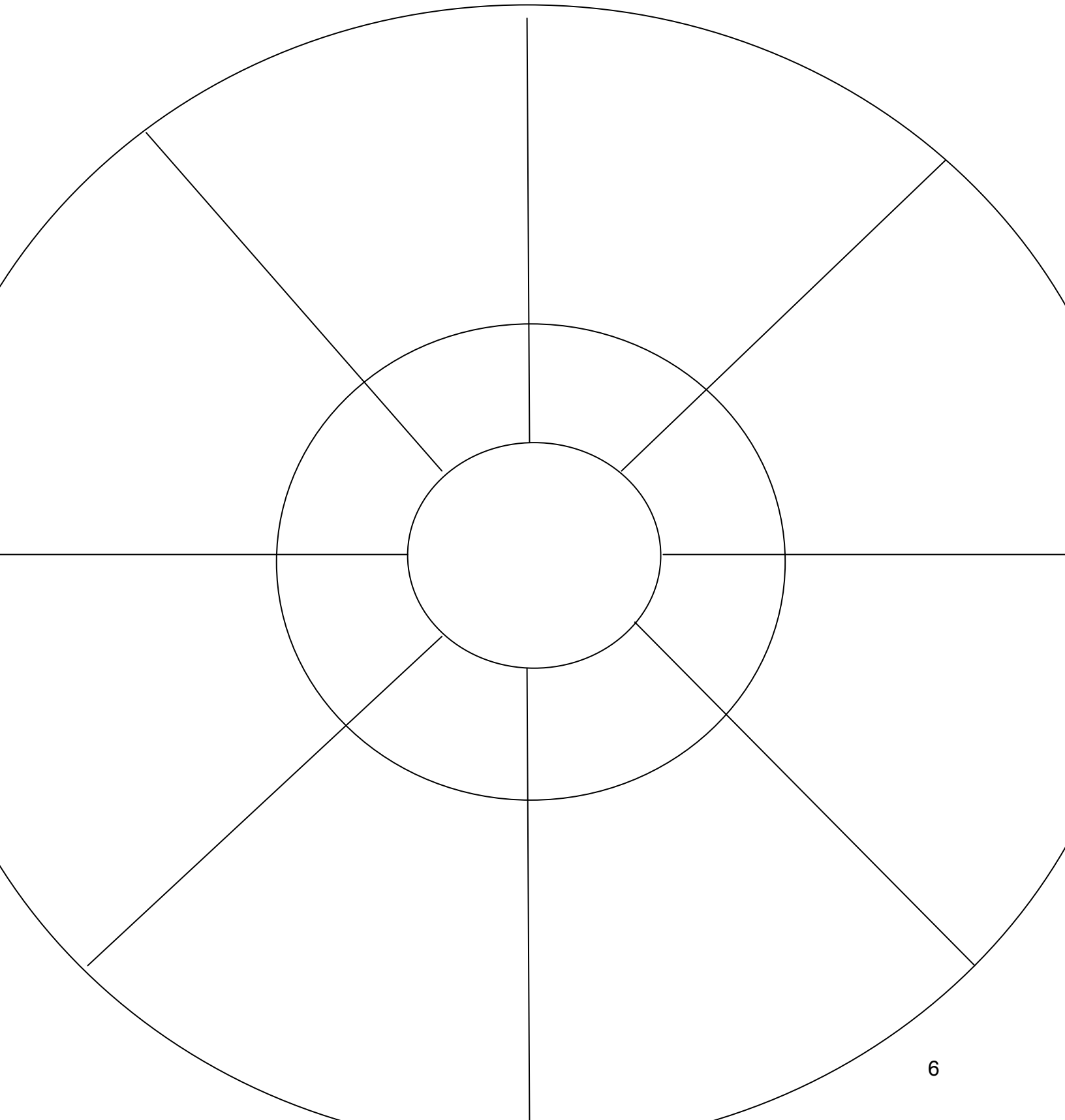
Basic Science Terms:

Ecology	Evaluate
Genome	Contrast
HIV	Categorize
Cancer	Conclude
Cystic Fibrosis	Support
	Classify

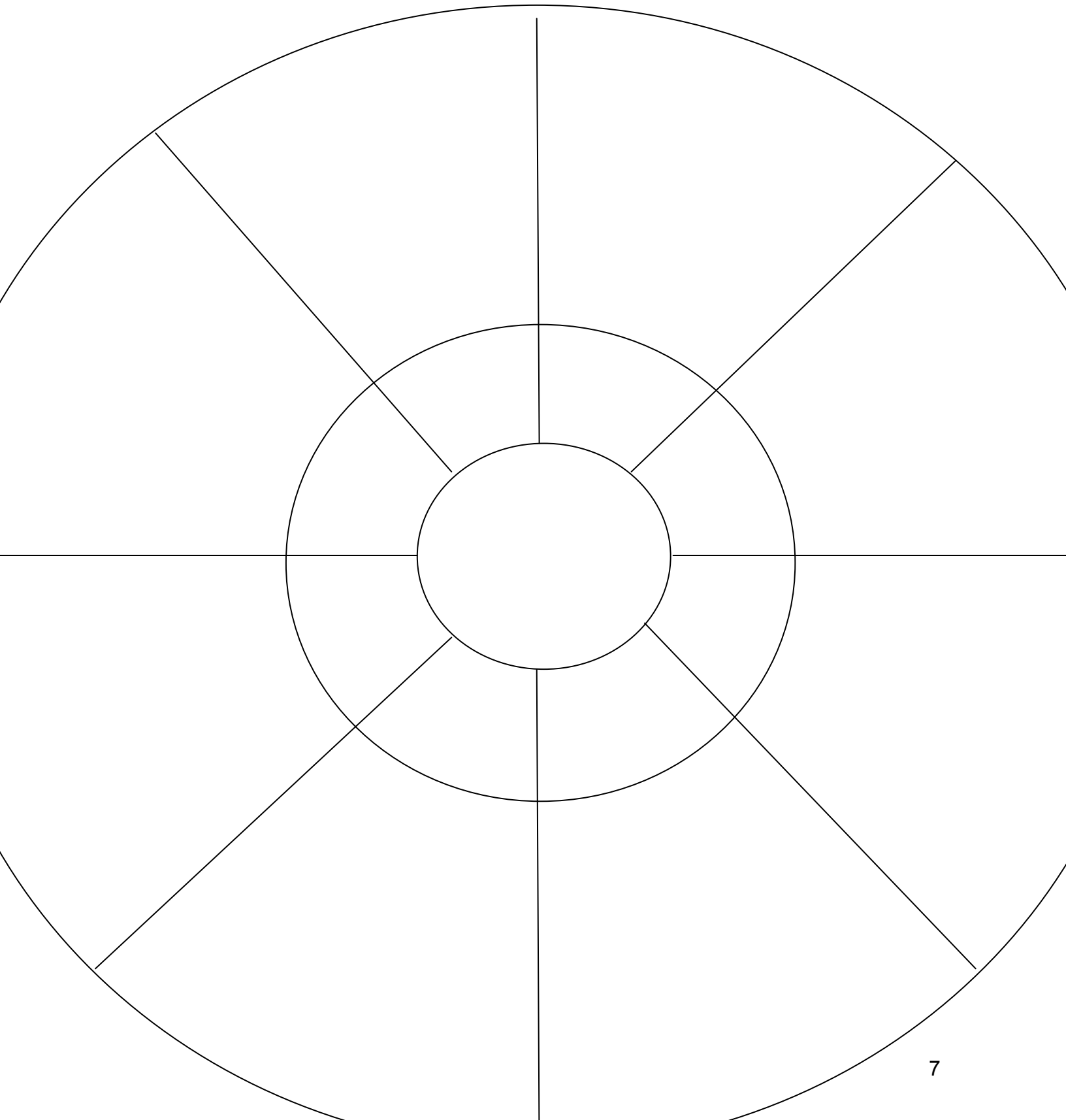
Must Knows:



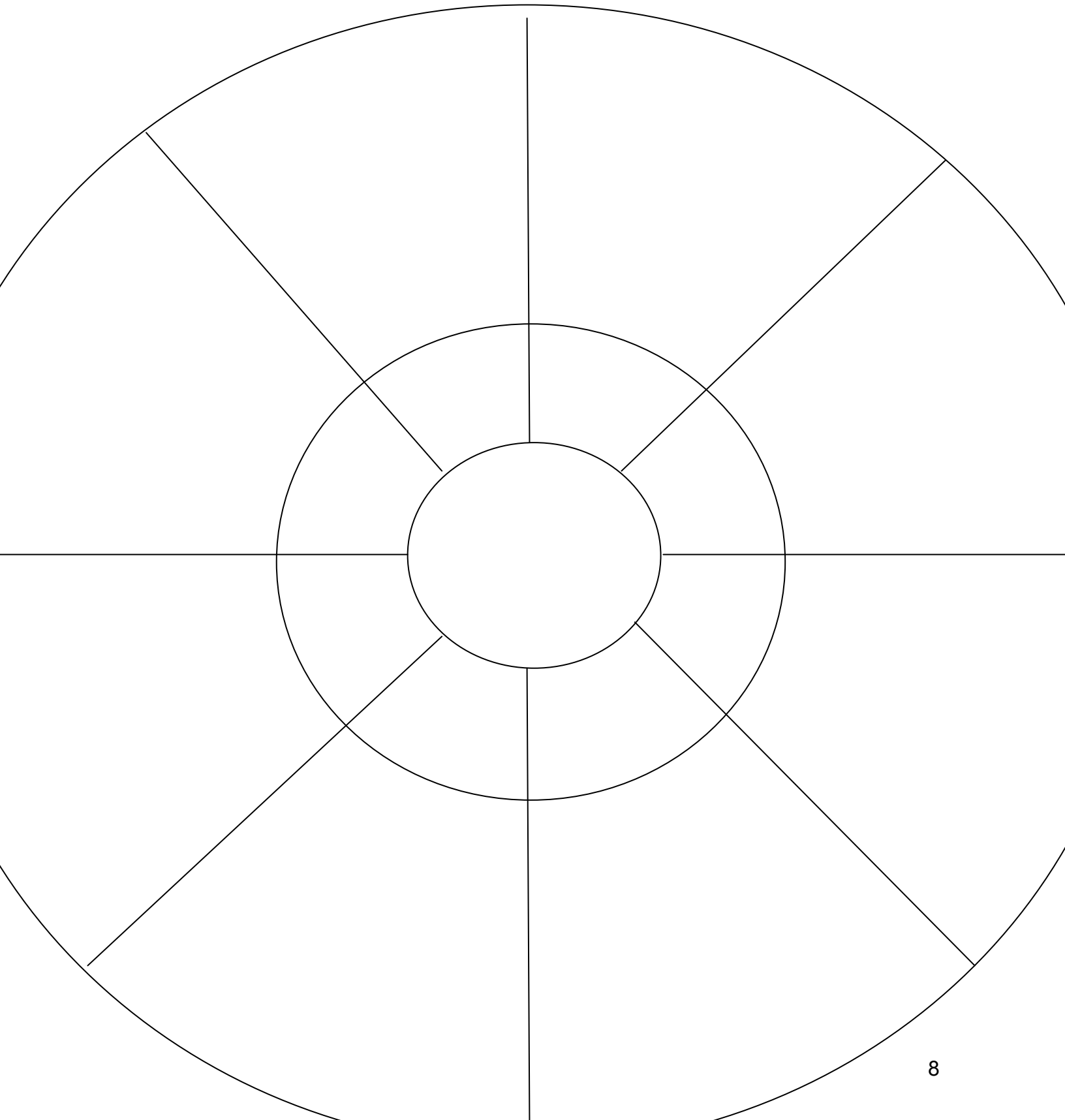
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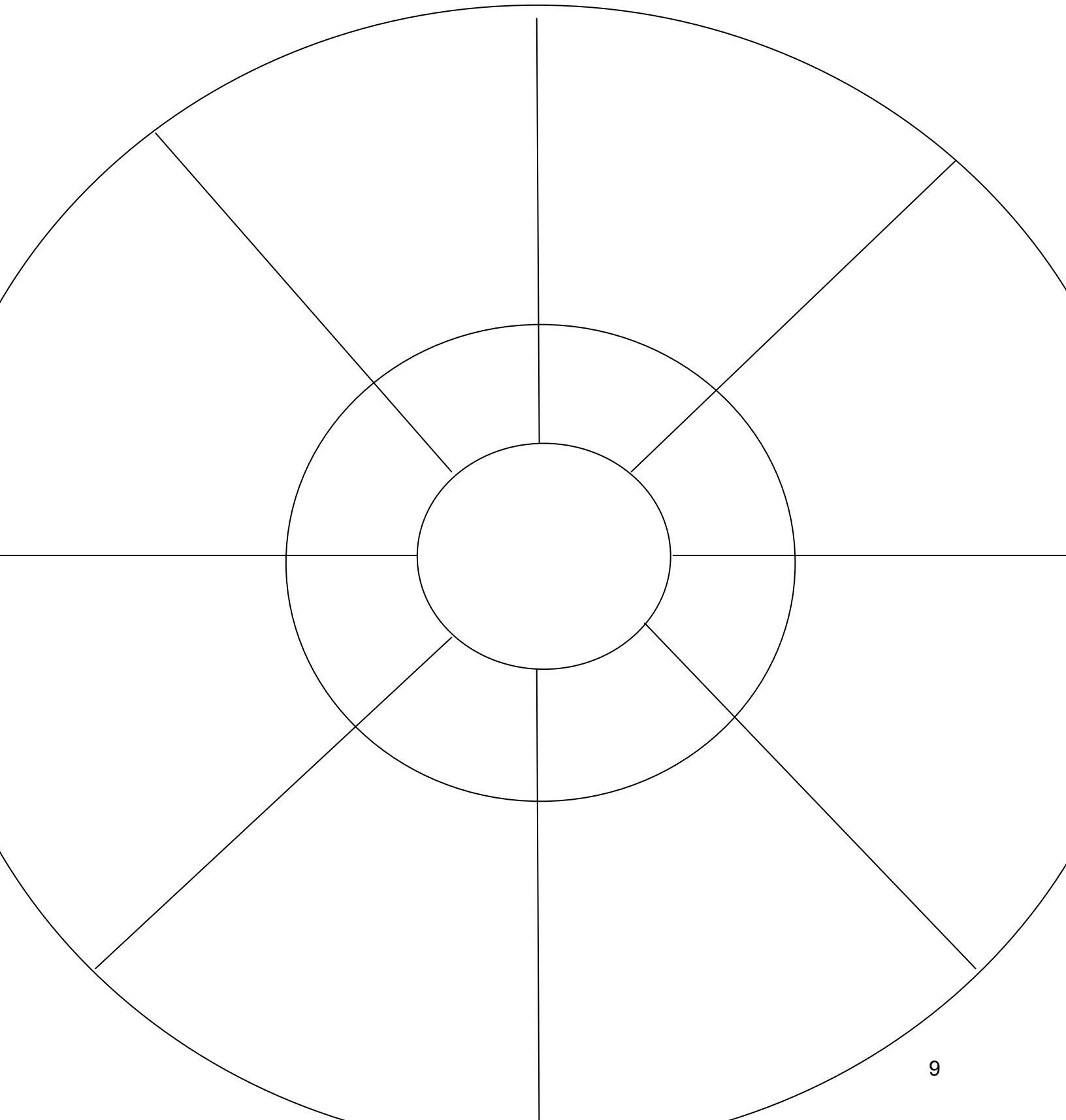
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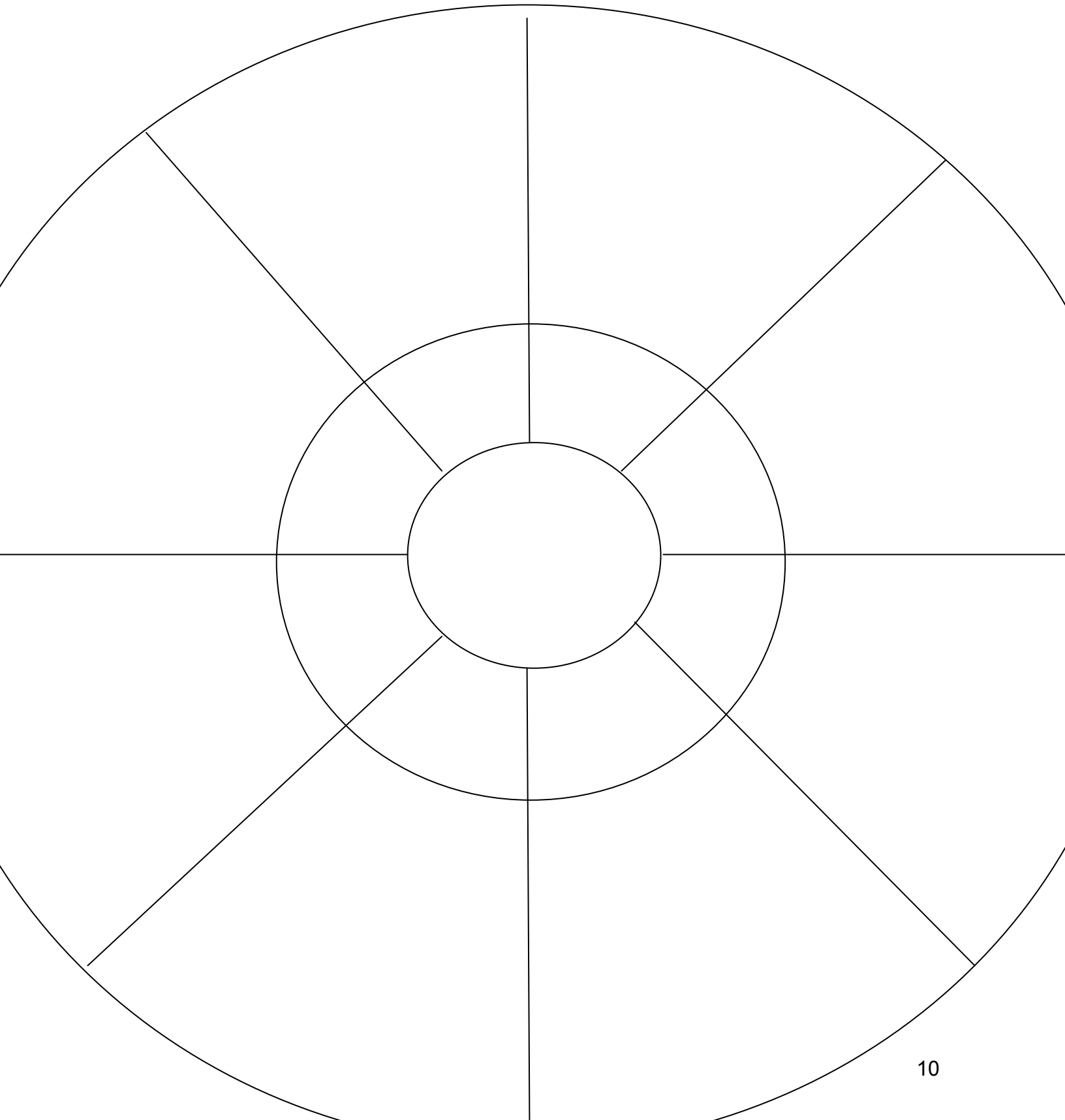
Must Knows:



Must Knows:



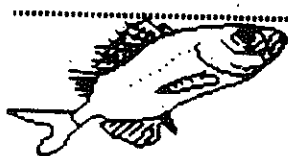
Must Knows:



Identifying Parts of the Scientific Method

Quiz

Name: _____ code #: _____



Two related populations of minnows live in the same pond. One population is dark green and the other is brown in color. Ecologists suspect that minnow color somehow determines the number of each variety found in the pond. The ecologists decide that brown minnows are more easily preyed on by bass because they stand out against the weeds on the pond bottom. To test this idea, they mark an equal number of dark green and brown minnows, release them, in the pond, and later trap the survivors. When they count the trapped minnows, they find more dark green ones than brown ones. Another group, of unmarked minnows, some green and some brown, were put in the pond under protective caging. There was no change in the number of caged minnows, during this experiment.

Part I



- ___ 1. Counting trapped minnows did what to the statement about color? A) did not favor it b) disproved it c) supported it d) showed nothing
- ___ 2. The number of each color of minnows is/are a) interpretation b) data c) controls d) experiments
- ___ 3. The ecologists' statement that brown minnows are more easily found by bass is a) hypothesis b) control c) observation d) experiment
- ___ 4. That both dark green and brown minnows are found is a) hypothesis b) fact c) interpretation d) conclusion
- ___ 5. Marking, trapping, and counting of minnows is a) a variable factor b) theory c) hypothesis d) experimentation
- ___ 6. The caged minnows served as the a) conclusive group b) experiment group c) control group d) variable factor
- ___ 7. The ecologists' reasoning that color influences the number of minnows could become a) observation b) fact c) theory d) interpretation
- ___ 8. The variable factor in the experiment involved a) weed color b) bass color c) minnow color d) pond size



Over

Name _____ Date _____ Class _____

*Use after Section 1:3.***CAN YOU SPOT THE SCIENTIFIC METHOD?**

Each sentence below describes a step of the scientific method. Match each sentence with a step of the scientific method listed below.

A. recognize a problem**C.** test the hypothesis with an experiment**B.** form a hypothesis**D.** draw conclusions

- _____ 1. Stephen predicted that seeds would start to grow faster if an electric current traveled through the soil in which they were planted.
- _____ 2. Susan said, "If I fertilize my geranium plants, they will blossom."
- _____ 3. Jonathan's data showed that household cockroaches moved away from raw cucumber slices.
- _____ 4. Rene grew bacteria from the mouth on special plates in the laboratory. She placed drops of different mouthwashes on bacteria on each plate.
- _____ 5. Kathy used a survey to determine how many of her classmates were left-handed and how many were right-handed.
- _____ 6. Dana wanted to know how synthetic fibers were different from natural fibers.
- _____ 7. Jose saw bats catching insects after dark. He asked, "How do bats find the insects in the dark?"
- _____ 8. Justin wondered if dyes could be taken out of plant leaves, flowers, and stems.
- _____ 9. Arjulia soaked six different kinds of seeds in water for 24 hours. Then she planted the seeds in soil at a depth of 1 cm. She used the same amount of water, light, and heat for each kind of seed.
- _____ 10. Bob read about growing plants in water. He wanted to know how plants could grow without soil.
- _____ 11. Kevin said, "If I grow five seedlings in red light, I think the plants will grow faster than the five plants grown in white light."
- _____ 12. Angela's experiment proved that earthworms move away from light.
- _____ 13. Scott said, "If acid rain affects plants in a particular lake, it might affect small animals, such as crayfish, that live in the same water."
- _____ 14. Michael fed different diets to three groups of guinea pigs. His experiment showed that guinea pigs need vitamin C and protein in their diets.
- _____ 15. Kim's experiment showed that chicken egg shells were stronger when she gave the hen feed to which extra calcium had been added.

“Must Knows” covered:

Identify the Controls and Variables



Smithers thinks that a special juice will increase the productivity of workers. He creates two groups of 50 workers each and assigns each group the same task (in this case, they're supposed to staple a set of papers). Group A is given the special juice to drink while they work. Group B is not given the special juice. After an hour, Smithers counts how many stacks of papers each group has made. Group A made 1,587 stacks, Group B made 2,113 stacks.

1. Write a Hypothesis for Smithers's.
- Identify the...
2. Control Group
3. Experimental Group
4. Independent Variable
5. Dependent Variable
6. What should Smithers' conclusion be?
7. How could this experiment be improved?



Homer notices that his shower is covered in a strange green slime. His friend Barney tells him that coconut juice will get rid of the green slime. Homer decides to check this out by spraying half of the shower with coconut juice. He sprays the other half of the shower with water. After 3 days of "treatment" there is no change in the appearance of the green slime on either side of the shower.

8. What was the initial observation?
- Identify the...
9. Experimental Group
10. Control Group
11. Independent Variable
12. Dependent Variable
13. What should Homer's conclusion be? It doesn't work

Bart believes that mice exposed to radiowaves will become extra strong (maybe he's been reading too much Radioactive Man). He decides to perform this experiment by placing 10 mice near a radio for 5 hours. He compared these 10 mice to another 10 mice that had not been exposed. His test consisted of a heavy block of wood that blocked the mouse food. he found that 8 out of 10 of the radiowaved mice were able to push the block away. 7 out of 10 of the other mice were able to do the same.



14. Write a hypothesis for Bart.
- Identify the...
15. Control Group
16. Experimental Group
17. Independent Variable
18. Dependent Variable
19. What should Bart's conclusion be?
20. How could Bart's experiment be improved?



Krusty was told that a certain itching powder was the newest best thing on the market, it even claims to cause 50% longer lasting itches. Interested in this product, he buys the itching powder and compares it to his usual product. One test subject (A) is sprinkled with the original itching powder, and another test subject (B) was sprinkled with the Experimental itching powder. Subject A reported having itches for 30 minutes. Subject B reported to have itches for 45 minutes.

Identify the...

21. Control Group
22. Experimental Group
23. Independent Variable
24. Dependent Variable
25. Explain whether the data supports the advertisements claims about its product.



Time to design your own experiment

Lisa is working on a science project. Her task is to answer the question: "Does Rogooti (which is a commercial hair product) affect the speed of hair growth". Her family is willing to volunteer for the experiment.

Step 1: State your problem/Ask a question (What is the question for Lisa's experiment?)

Step 2: For a Hypothesis for Lisa's experiment

Step 3: Experiment – Design an experiment that would test Lisa's question. Write a step by step procedure that you would like Lisa to follow. Include ALL details that she would need to complete the experiment. (Use the next page if you need it)

What is the control group?

What is the experimental group?

What is the independent variable?

What is the dependent variable?

Step 4: Collect Data – (makeup the data)

Step 5: Conclusion – What sort of conclusion should you be able to make after interpreting the data of the experiment?

BAR AND LINE GRAPHS

Purpose/Problem: "This experiment is confusing!", exclaims Clair. "We have so much information to analyze. I have placed all of the information into data tables but I still cannot see if there is a trend in the results." "Maybe we should plot our data on a graph to see if there are changes or if comparisons can be made among our experiment's data?", asks Jennifer. How can graphs be useful when working with data?

Background information: Often results of an experiment are shown in a graph. A graph is a picture that shows data. A graph can show data in a way that helps the information to be understood. There are many different kinds of graphs. Here's how to make and to use two kinds of graphs. One type is a bar graph and the other is a line graph.

Materials: graph paper two sheets
colored pencils
ruler

Procedure:

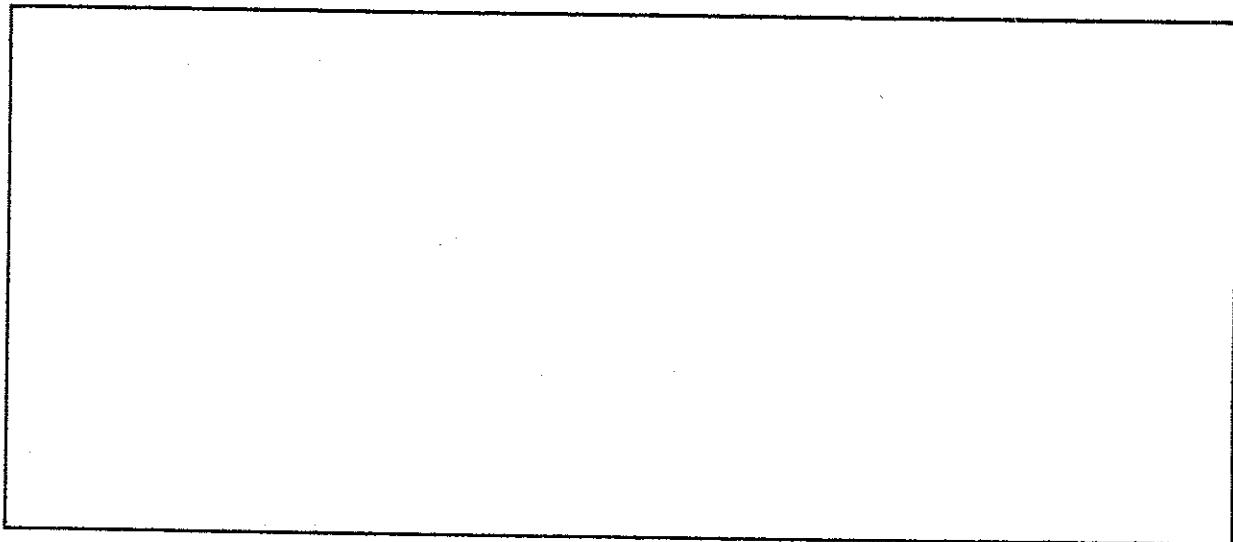
Part A: Bar Graphs

Suppose you gathered these data on how long certain animals can hold their breath under water. human--1 min., grey seal--20 min., muskrat--12 min., walrus--10 min., bottle-nose whale--120 min., beaver--15 min., blue whale--49 min. Comparing these results is difficult to do when the data are in this form. So a bar graph will give you a "picture" of this data.

1. First the data needs to be organized into a data table. Design a **DATA TABLE** for this data in *Figure 1*.

DATA TABLE: (Put in the lines you need, use descriptive headings and add a title.)

Figure 1



2. Next graph this data, from *Figure 1*, on graph paper, in the most helpful way possible. A Bar (Histogram) graph would be useful since you are making comparisons.
3. To begin making any graph you must define (highlight) the vertical and the horizontal axes on the graph paper that you are using.
4. Mark the vertical line (y-axis) into equal sized, numbered sections. Make the highest number on this line the highest number in your results. In this case, the number is 120. The bottom of the vertical line is zero. Mark the units on the line outside of the axis line.
5. Label this axis "Minutes Under Water".
6. List the other information along the horizontal line (x-axis) at the bottom of the graph. In this case, list the different animals. Space these data evenly along the line. Count the number of squares available so that you can determine the number squares you can allot to each animal. Think of the most helpful layout to list the information on the graph.
7. Label this axis with each animal type denoting its column and label the entire axis "Animals"
8. Complete the graph by drawing the bars to indicate the correct heights for the gathered data. For example, the bar for the grey seal should go up to the number 20 on the vertical line.
9. Add an informative title to this graph.
10. This display of data should make the data easier to use and understand. For an example of such use, answer the next two questions.

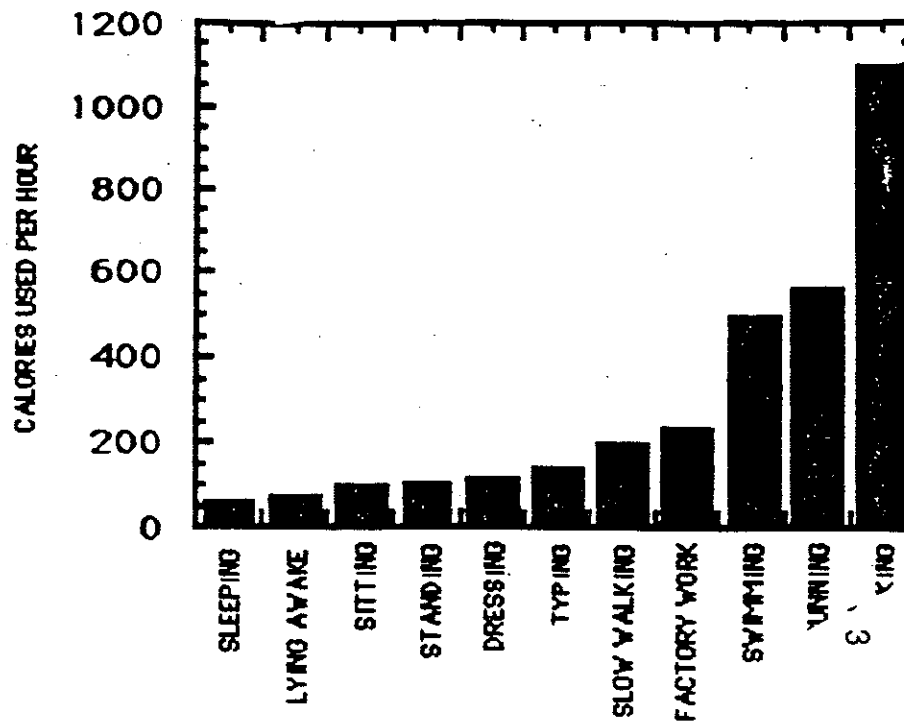
10a) Which animal holds it breath for the shortest amount of time? _____

10b) List four of the animals that hold their breath about the same amount of time.

11. Complete the following questions by using the graph in *Figure 2*.

ENERGY USED FOR DIFFERENT ACTIVITIES FOR A 70 KG MAN

Figure 2



- 11a) What is the title of the graph? _____
- 11b) What are the units used to measure amount of energy used? _____
- 11c) Which activity uses the least amount of energy? _____
- 11d) How much energy per hour does typing require? _____
- 11e) How much more energy per hour is used for walking up stairs than slow walking? _____
- 11f) If a 100 kg man were dead, how much energy would he use? _____
- 11g) How much energy would 70 kg man use working in a factory for 8 hours? _____
- 11h) How much energy would be used swimming for half an hour? _____
- 11i) Estimate the amount of energy used during a 50 minute exam. Show your work.

Part B: Line Graphs

Line graphs can be used to show change. The horizontal (x-axis) and vertical (y-axis) for the graph outline are shown the same as in the bar graph. This time, however, you plot or put on the graph each data point that was collected. Here's an example: A biologist studying ocean water wanted to know how the temperature changed as the water got deeper. The table in *Figure 3*, below shows the data gathered. Follow the steps below to graph the data.

Water Depth and Temperature

(x) Water Depth (meters)	(y) Temperature ($^{\circ}\text{C}$)
0	18
25	18
50	18
75	15
100	12
150	5
200	4
250	4
300	3

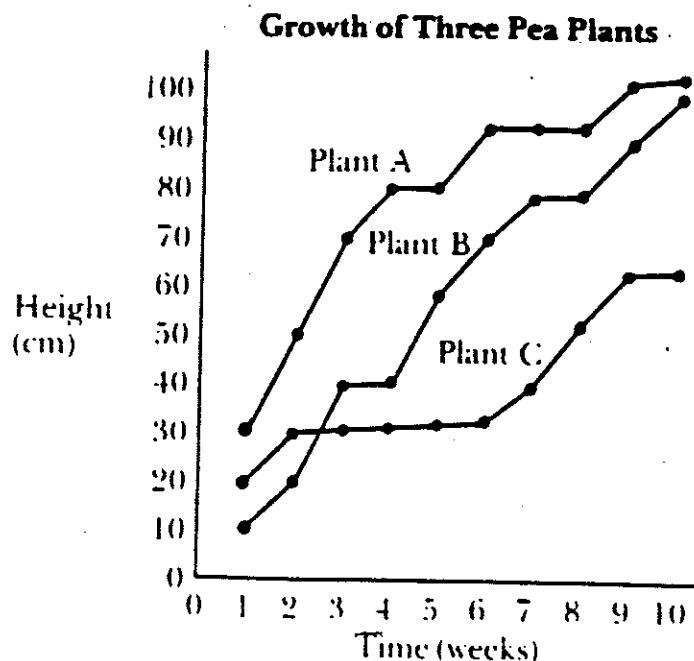
Figure 3

12. Define (highlight) both the vertical and the horizontal axis on the graph.
13. Mark the lines on the horizontal line to plot the depths. Count the number of lines available and divide by the amount of numbers used in the data. Depth goes from 0 m on the ocean's surface to 300 m below the surface.
14. Label this axis and be sure to include units.
15. Mark the lines on the vertical axis in equal segments from 0°C to 18°C .
16. Label this axis "Temperature" ($^{\circ}\text{C}$).
17. Look at the information in *Figure 3*. Use the first set of results given. Find the line marked 0 meters. Move up the line until you reach the 18°C temperature. Mark the point with a dot.
18. Go to the second line of results in the table. Find 25 m on the graph, move up that line to 18°C at that intersection.
19. Repeat these steps with the remaining data in the table in *Figure 3*.
20. Connect the points with a smooth curve.
21. Add an informative title to the graph.

22. How the temperature changes as you move deeper in the water can more easily be seen with this graph. Also, you can determine values from the graph that are not the actual data points you plotted.

22a) Give the temperature of the water at the depth of 125 m. _____

24. Using the multiple line graph, *Figure 4*, involving three pea plants answer the following questions.



24a) For the weeks given, record the heights of the three plants.

Week	Plant A	Plant B	Plant C
3	_____	_____	_____
7	_____	_____	_____
10	_____	_____	_____

24b) How many weeks did it take for plant A to reach 90 cm? _____

24c) Which plant remained at about 30 cm for 4 weeks? _____

24d) Which plant remained at 90 cm for 2 weeks? _____

24e) When plant A was 50 cm tall how tall was plant C? _____

24f) Which plant grew the most? _____

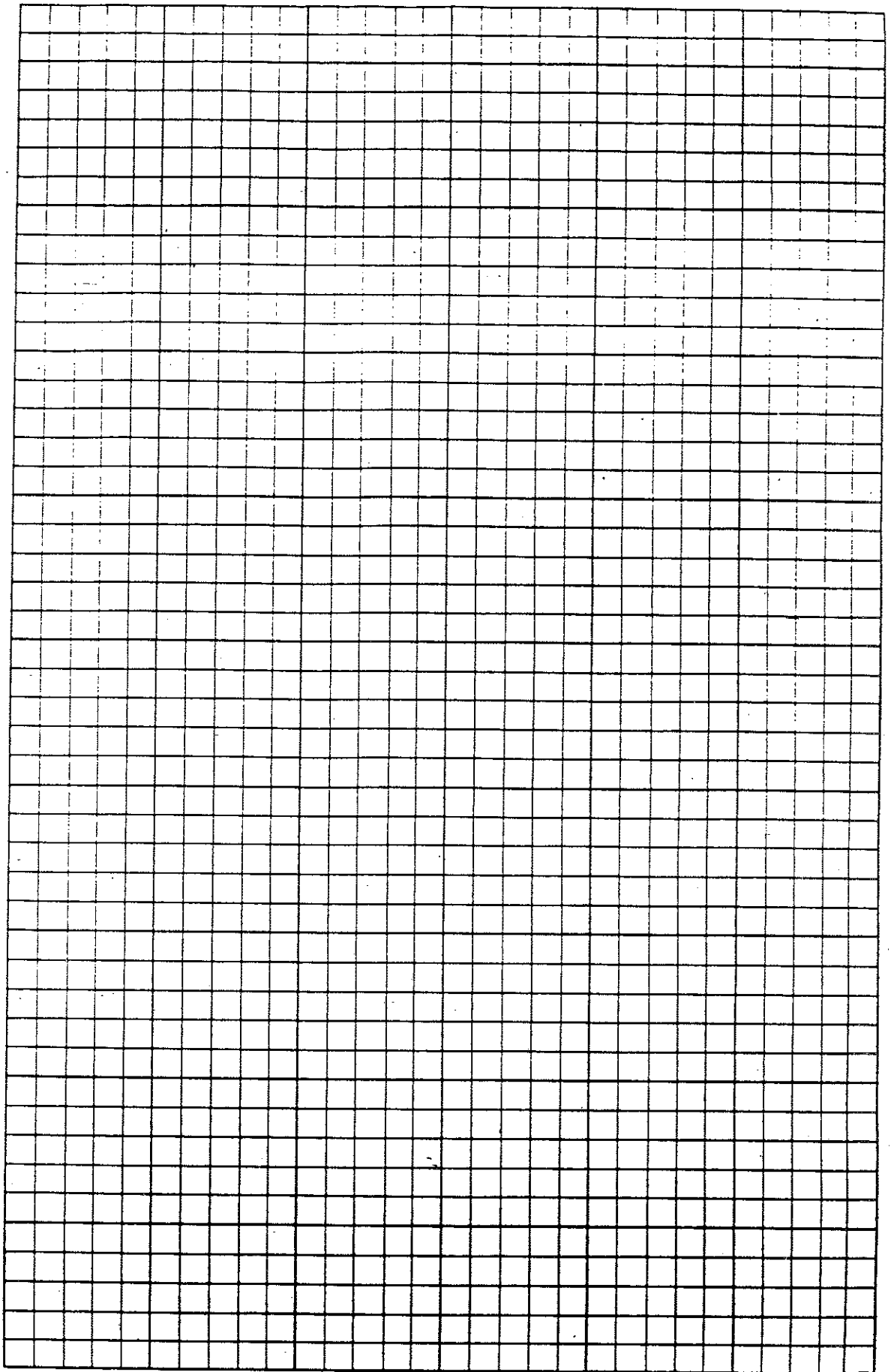
24g) Which plant grew the least? _____

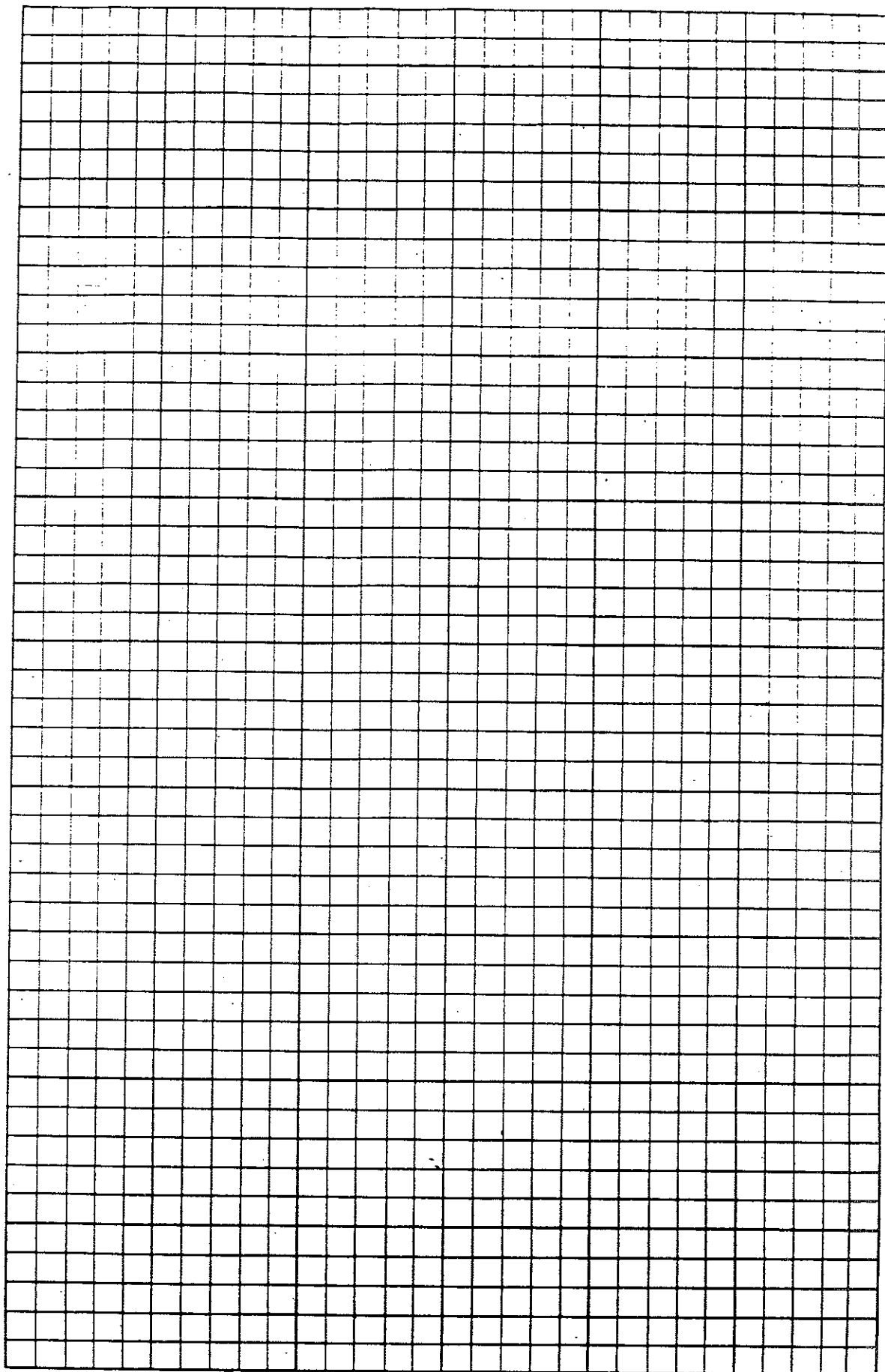
24h) Which plant was probably sick? _____

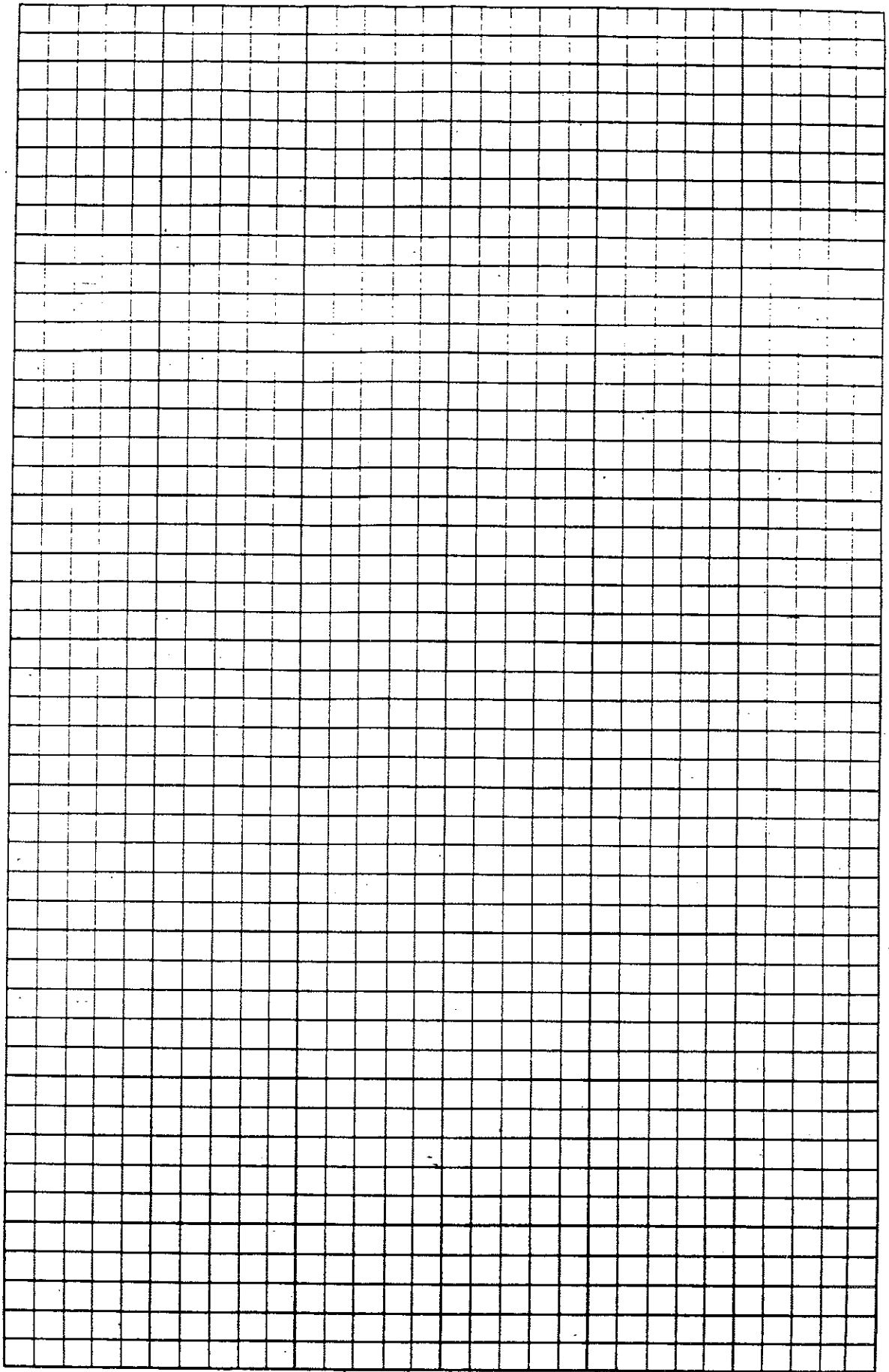
ANALYSIS: Answer the following by using complete sentences. Refer to the graphing exercises and information when thinking of your reply.

1. How is a graph similar to a data table?
2. How is a line graph used differently from a bar graph?
3. Does a steep curve on a line graph indicate a rapid or a slow rate of change?
4. What is the advantage of using multiple lines on a line graph, as was done with the pea plant growth?
5. Suppose that you are conducting an experiment to measure the gain in mass of a young mouse over a ten week period. In constructing a graph to represent your data, which variable should you place along the the x-axis and which variable should you place along the y-axis? Explain your answer.
6. Why is it important to have all parts of a graph clearly labeled and drawn?

Conclusion: Answer the question posed at the beginning of this activity.







Chapter 1 Review

Match the definitions to the vocabulary words.

hypothesis West Nile Virus genetic engineering biology prediction
gene therapy dependent variable independent variable Human Genome Project

- _____ 1. the study of life
- _____ 2. variable that is measured in an experiment
- _____ 3. allowed scientists to read every human gene
- _____ 4. an educated guess based on what is already known
- _____ 5. a factor that is changed in an experiment
- _____ 6. a tool used to increase world food supply
- _____ 7. the expected outcome of an experiment
- _____ 8. an emerging disease transmitted by mosquitoes
- _____ 9. replacing a defective gene with a normal one

Match the definitions to the vocabulary words.

theory energy cell reproduction heredity
homeostasis gene acid metabolism cancer

- _____ 10. the basic unit of heredity
- _____ 11. the transfer of genetic traits from parent to offspring
- _____ 12. parents produce offspring through this process
- _____ 13. exposure to chemicals, diet, and tobacco use can lead to this disease
- _____ 14. smallest unit capable of all life functions
- _____ 15. maintaining a balance within cells and their environment
- _____ 16. Harte thought the salamanders were being killed by this type of rain
- _____ 17. all of the chemical reactions carried out by living things
- _____ 18. to run the processes of life all living things need this
- _____ 19. a set of tested and confirmed hypotheses

Name _____ Block _____

20. List the seven properties of life:

21. Put the stages of a scientific investigation in order. Number 1 - 5

_____ predictions

_____ testing predictions with experimenting

_____ hypothesis

_____ observations

_____ drawing conclusions

Use the following terms to complete the statements below.

hypothesis

control group

prediction

22. Scientists design experiments to test their _____

23. The group in an experiment that receives no experimental treatment is the _____

24. Harte thought that he would find acid in the ponds after the snow melted. This is a _____

25. In order to produce more food, scientists are developing crops that:

a. _____

b. _____

c. _____